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MAGNET CONTROLLED SWITCH

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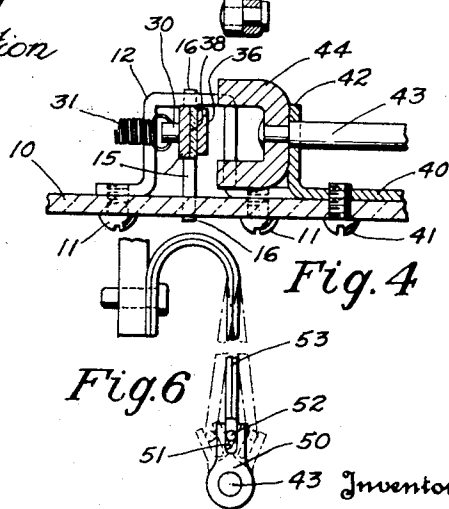
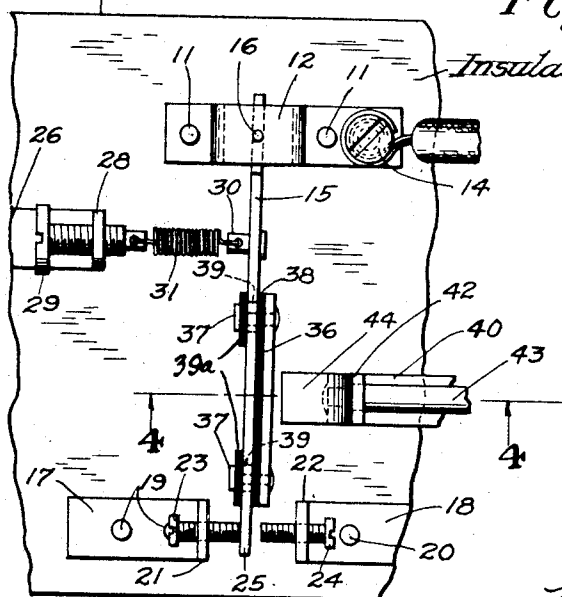
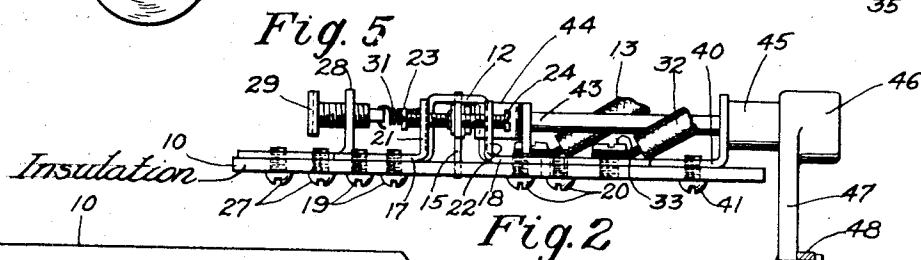
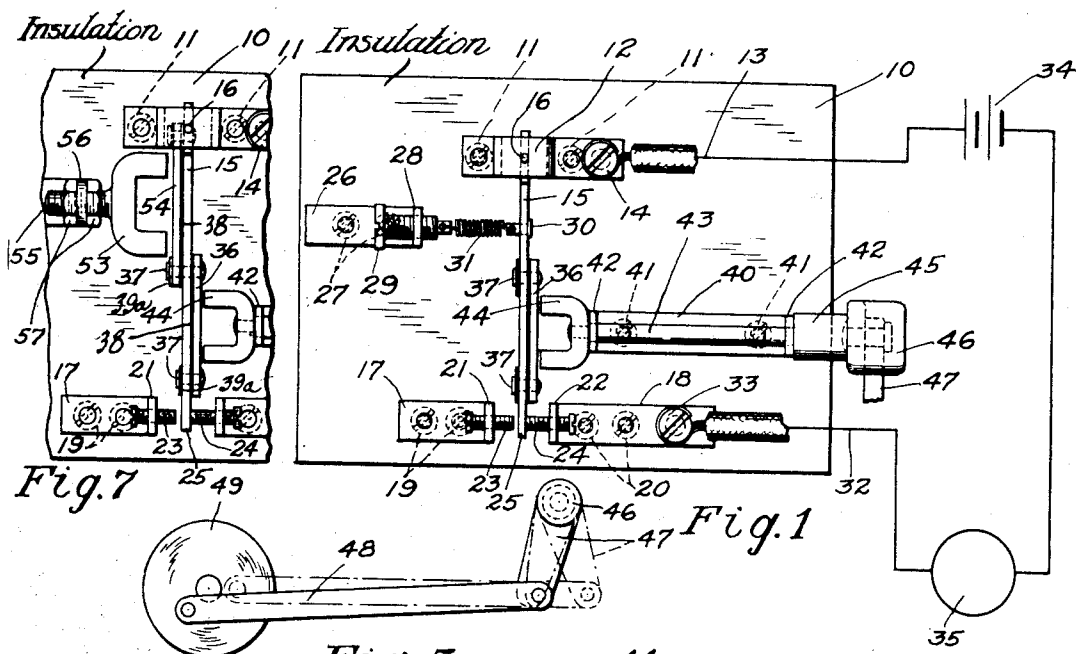


Fig. 3

Fig. 6

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MAGNET CONTROLLED SWITCH

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14 Claims. (Cl. 200—87)

This invention relates to new and useful improvements in control means, and has particular relation to a magnet controlled switch.

An object of the invention is to provide a control means for shifting a member to operate a switch, valve or the like, and which means will not be subject to noticeable wear even after very long and constant usage.

A further object is to provide a means as indicated and which requires practically no force for its operation and so may be operated by a very delicate thermostat or the like.

Another object is to provide a magnet controlled switch wherein a rapid make and break is obtained.

Other objects and advantages will become apparent from a consideration of the following detailed description taken in connection with the accompanying drawing wherein a satisfactory embodiment of the invention is shown. However, it will be understood that the invention is not limited to the details disclosed but includes all such variations and modifications as fall within the spirit of the invention and the scope of the appended claims.

In the drawing:

Fig. 1 is a top plan view illustrating a control means constructed in accordance with the invention the said means being shown in the form of a switch and a circuit being indicated;

Fig. 2 is a side elevational view the same being taken looking from the forward edge of Fig. 1;

Fig. 3 is a plan view of a portion of the control means and switch on an enlarged scale showing the parts in the other position from Fig. 1;

Fig. 4 is a detail sectional view taken substantially along the line 4—4 of Fig. 3;

Fig. 5 is an elevational view illustrating one means of operating the control means of the invention;

Fig. 6 is a view illustrating a suggested arrangement for operating the present control by means of a thermostat; and

Fig. 7 is a plan view showing a modification.

In the drawing the control means is illustrated in the form of a switch and at 10 is shown a board or panel of insulating material to which is secured as by means of screws 11 a substantially U-shaped bracket member 12 formed of conducting material and to which a wire 13 may be secured as by a binding screw 14. An element or member 15 in the form of a switch arm is pivotally mounted by the plate or panel 10 and the bracket 12 and includes a portion disposed be-

tween the arms of the bracket and provided with upper and lower projections or lugs 16 having bearing in the bracket and in the panel respectively whereby the member is pivotally mounted and electrically connected with the bracket and through the bracket with the wire 13.

A pair of brackets 17 and 18 are secured to panel 10 in spaced relation as by means of screws 19 and 20, and these brackets include up-turned end portions 21 and 22 through which are threaded screws 23 and 24, the said screws being arranged in opposed relation and adjustable toward and from one another. As will be apparent from the drawing, the free end portion 25 of the member 15 is arranged between the screws 23 and 24, and it will be understood that the said screws act as stops or limiting means to control the movement of the member about its pivot. Obviously, as these screws are adjusted away from and toward one another greater or lesser movement of member 15 will be permitted.

A bracket 26 is secured on the upper side of the panel 10 as by means of screws 27, and this bracket includes an up-turned end portion 28 through which is threaded a screw 29. Anchored at one end to the screw 29, and at its other end to an attaching piece 30 carried by the member 15, is a coil spring 31, which spring is tensioned to constantly urge the member about its pivot in a direction to have its free end portion engage the stop or limiting screw 23 before referred to. The screw 29 may be adjusted through the up-turned end portion 28 of bracket 26 to increase or lessen the tension of the spring 31.

The bracket 18 includes a relatively long portion on the panel 10, and this bracket is formed of electrical conducting material and has a wire 32 connected therewith as by a binding screw 33. The screw 24 on bracket 18 is electrically connected with the bracket, and it will now be apparent that when the free end portion 25 of member or switch arm 15 engages said screw a circuit will be completed between the wires 13 and 32. In this circuit is included a battery or other source of electrical energy 34 and any suitable signal or other mechanism, such as an electric counter or the like 35.

Member or switch arm 15 carries an armature 36 attached thereto as by rivets or the like 37, and insulated therefrom as by a strip of insulating material 38 by collars 39 of insulating material which collars are disposed about the rivets 37 whereby said rivets pass through the arm 15, and by insulating washers 39a between the heads

of the rivets and the area. A bracket 40 is secured to the panel 10 as by screws 41 and this bracket includes upstanding end portions 42 rotatably mounting a rod 43 which at its forward end carries a permanent horseshoe magnet 44 arranged in relatively close relation to the armature 36.

To the opposite end of the rod there is attached a head or operating portion 45 to which may be secured any suitable operating means as will later be described. The relation of the parts and the tension or strength of spring 31 with relation to the strength of the magnet 44 is such that when the parts are positioned as shown in Figs. 1 and 2 the magnet will have sufficient attraction for the armature 36 to overcome the pull of the spring 31 and the switch arm 15 will be rocked about its pivot to bring its free end portion into engagement with the screw 24 thus closing a circuit between the wires 13 and 32. It will particularly be noted in Fig. 1 that while the switch arm 15 has engaged the combined stop and contact screw 24 the armature 36 has not come into engagement with the magnet 44. The screw 24 is preferably set to prevent the armature engaging the magnet so that there is no contact or friction between the parts to cause wear and whereby the armature is prevented from freezing to the magnet, but the device will operate if the armature should engage the magnet.

Rod 43 is freely turnable with the magnet 44 and this rod when shifted may move the magnet from its position in Fig. 1 to that in which it is shown in Figs. 3 and 4 or some intermediate position. This brings the magnet to such a position that its attraction for the armature 36 is reduced, and when it becomes less than the pull of spring 31 this spring acts to shift the switch arm or member 15 away from the screw 24 and into engagement with the screw 23. The make and break action is rapid since the spring does not begin to shift the arm 15 until the spring overcomes the magnetic attraction between the armature and magnet 44 and when this occurs the spring snaps the arm into engagement with screw 23. Also, when the magnet is shifted into a position where its attraction for the armature overcomes the pull of the spring as shown in Fig. 1 the switch arm is rocked on its pivot to engage the screw 24 and close the circuit.

The circuit may be very rapidly closed and opened by rotating the rod 43 and consequently the magnet 44, or the same effect may be accomplished by oscillating the magnet and the switch will operate on the magnet being oscillated through an arc of considerably less than 90° depending on the strength of the spring and the design of the various elements. Figs. 1, 2, and 5 suggest a means for oscillating the magnet and this means includes a head 46 attached to the part 45 and carrying a crank arm 47 to which is pivotally connected a pitman 48 eccentrically attached or pivoted to a rotatable wheel or disc 49. Rod 43 has bearing at only two points and the entire device may be of relatively light construction whereby it is turnable with the utmost ease, friction and wear being reduced to a minimum.

Since the device may be easily rotated or oscillated it will be apparent that it may be operated by a very delicate thermostat since the thermostat itself is not required to throw the switch but merely to rock the magnet through a small arc. Such an arrangement is illustrated in Fig. 6 wherein a head 50 is attached to the rod 43, the said head having a slot 51 receiving a pin

52 carried by and forming part of a thermostat 53. The broken lines in this figure suggest the action of the thermostat, and it will be apparent that it is necessary to rock the rod 43 and the magnet 44 only through a small arc to have the magnet act on the armature and draw the arm 15 into circuit closing position and to have the magnet again release the armature permitting the spring to shift the arm out of circuit closing position.

In Figs. 1 to 5 a spring is shown as the means for moving the switch member in the opposite direction from the magnet 44. I am, however, not limited to this means as others may be employed. In Fig. 7 I have shown a second magnet 53 on the opposite side of the movable member 15 and attracting an iron or steel armature 54 insulated from member 15 the same as armature 36. The magnet 53 is mounted so that it may be adjusted toward and from the member 15 whereby it may be positioned for best operation. It may have a threaded extension 55 extending through a mounting bracket 56 and secured in adjusted position by nuts 57. It should be adjusted so as to be slightly spaced from the armature 54 when the switch member 15 is held by this magnet against the stop or contact 23. The magnet 53 will be larger or smaller, that is stronger or weaker, than magnet 44 depending on its position with respect to the pivot 16. The two magnets should be so proportioned and positioned that when magnet 44 is in the position of Fig. 7 the switch member is shifted by it, but when the magnet 44 is turned as indicated in Figs. 3 and 4 the magnet 53 will have the greater influence on member 15 and will shift it in the opposite direction.

From the foregoing description it will be apparent that since the device is so easily operated there is very little friction and consequently very little wear so that there is small likelihood of the device wearing out. While the disclosure specifically relates to a switch it will be appreciated that the arm 15 might be used for turning a valve or the like. In the form of a switch the device finds ready application in counting machines where a large number of makes and breaks are required. Further, the device may as pointed out be operated by a thermostat, and since the device may be operated with a minimum of effort a very delicate thermostat may be used. A rapid make and break is had because the switch arm is not shifted in either direction until there is available a force sufficient to shift it quickly. It will be evident that the effect or pull of the magnet on the armature is varied by a relative turning movement between the magnet and the armature, and therefore these parts may be reversed and the armature may be turned relative to the magnet.

Having thus set forth the nature of my invention, what I claim is:

1. In combination, a movable member, means to shift said member in one direction, an armature connected with said member, means to shift said member in the opposite direction comprising a magnet having a pole movable adjacent said armature to vary its effect thereon, said magnet movable about an axis extending substantially parallel with said pole, and means for shifting the magnet about said axis to operate said member.

2. In combination, a movable member, means to shift said member in one direction, an armature connected with said member, means to shift

said member in the opposite direction comprising a magnet having a pole movable adjacent said armature to vary its effect thereon, said magnet movable about an axis extending substantially parallel with said pole, means for shifting the magnet about said axis to operate said member, and means to prevent movement of said member into position to bring the armature into engagement with the magnet.

3. In combination, a movable switch member, means to shift said member in one direction, an armature connected with said switch member, a magnet movable to and from a position to attract said armature to shift said member in the opposite direction, said magnet including a pair of poles, means mounting said magnet for movement about an axis extending between said poles, and means to shift said magnet about said axis to operate said member.

4. In combination, an operating member, means movably mounting said member, a stop at each side of said member to limit its movement, means tending to move said member in one direction, an armature on said member, a magnet having a pair of poles spaced apart a distance greater than one dimension of said armature and carried by a connecting portion and located adjacent said armature, means pivotally mounting the connecting portion of said magnet whereby the magnet may be turned to and from a position to attract said armature portion and shift said member against the action of the second mentioned means, and one of said stops arranged to prevent movement of said member into a position to bring its armature portion into engagement with the magnet.

5. In combination, a switch arm, means movably mounting said switch arm, a stop at each side of said switch arm to limit its movement, means tending to move said switch arm in one direction, an armature on said switch arm, a magnet having a pair of poles spaced apart a distance greater than a dimension of said armature and carried by a connecting portion and located adjacent said armature, means pivotally mounting the connecting portion of said magnet whereby the magnet may be turned to and from a position to attract said armature and shift said switch arm against the action of the second mentioned means, one of said stops arranged to be engaged by said switch arm in each of its extreme conditions, and one of said stops comprising a contact.

6. In combination, a movable member, means to shift said member in one direction, an armature connected to said member, and means to shift said member in the opposite direction comprising a magnet having spaced poles adjacent said armature, and means for turning said magnet about an axis at right angles to the armature to vary its pull on said armature.

7. In combination, a movable member, means to shift said member in one direction, an armature connected to said member, and means to shift said member in the opposite direction comprising a substantially U-shaped magnet mounted with its poles adjacent said armature, and means for turning said magnet about an axis at right angles to the armature to vary its effect thereon.

8. In combination, a movable member, a member mounted to turn about an axis extending in the general direction of movement of the first member, an armature carried by one of said members, a magnet carried by the other member having spaced poles adjacent the armature, and

means for turning the second member relative to the first to vary the effect of the magnet on the armature.

9. In combination, a movable switch member, a supporting member mounted to turn about an axis extending at substantially right angles to the plane of the first member, an armature carried by one of said members, a magnet carried by the other member having spaced poles adjacent the armature, and means for turning said supporting member to vary the effect of the magnet on the armature.

10. In combination, a movably mounted switch arm, a stop at each side of said arm to limit its movement, means tending to move said arm in one direction, a magnet having a pair of poles arranged at one side of said arm, means rotatably mounting said magnet on an axis passing between said poles, an armature on the switch arm, said magnet adapted to be turned on said axis to and from a position to attract said armature and shift the switch arm against the action of the first mentioned means, one of said stops arranged to be engaged by the switch arm in each extreme position of the latter, and one of said stops comprising a contact.

11. In combination, a movably mounted switch arm, a stop at each side of said arm to limit its movement, means tending to move said arm in one direction, a magnet having a pair of poles arranged at one side of said arm, means rotatably mounting said magnet on an axis passing between said poles, an armature on the switch arm, said magnet adapted to be turned on said axis to and from a position to attract said armature and shift the switch arm against the action of the first mentioned means, one of said stops arranged to be engaged by the switch arm in each extreme position of the latter, said stop against which the switch arm is moved by the magnet comprising a contact, and said stop comprising a contact arranged to prevent movement of the switch arm into a position to bring the armature into engagement with the magnet.

12. In combination, a movably mounted switch arm, a stop at each side of said arm to limit its movement, means tending to move said arm in one direction, a magnet having a pair of poles arranged at one side of said arm, means turnably mounting said magnet on an axis passing between said poles, an armature on the switch arm, said magnet adapted to be turned on said axis to and from a position to attract said armature and shift the switch arm against the action of the first mentioned means, one of said stops arranged to be engaged by the switch arm in each extreme position of the latter, and each of said stops adjustable toward and from said switch arm.

13. In combination, a movably mounted switch arm, a stop at each side of said arm to limit its movement, means tending to move said arm against one of said stops, means for adjusting the effect of said means, a magnet having a pair of poles arranged at one side of said arm, means turnably mounting said magnet on an axis passing between said poles, an armature on the switch arm, and said magnet adapted to be turned on said axis to and from a position to attract said armature and shift the switch arm into engagement with the other of said stops against the action of the first mentioned means.

14. In combination, a movably mounted switch arm, a stop at each side of said arm to limit its movement, means tending to move said arm into

engagement with one of said stops, means for adjusting the effect of said means, a magnet having a pair of poles arranged at one side of said arm, means turnably mounting said magnet on an axis passing between said poles, an armature on the switch arm, said magnet adapted to be turned on said axis to and from a position to attract

said armature and shift the switch arm into engagement with the other of said stops against the action of the first mentioned means, and each of said stops adjustable toward and from said switch arm.

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